GEOLOGICAL INTERPRETATIONS OF THE TOPOGRAPHY OF SELECTED REGIONS OF VENUS FROM ARECIBO TO GOLDSTONE RADAR INTERFEROMETRY.

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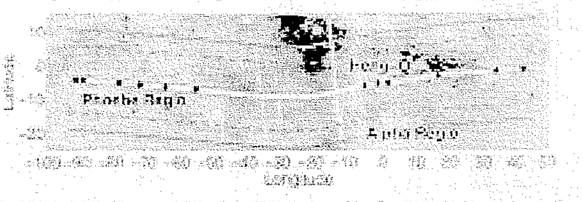
Introduction: We report on the geological interpretation of the mapping analysis of several successful radar experiments, which are part of a program to generate a high resolution digital elevation model (DEM) of the equatorial region of Venus between Phoebe Regio and far western Ovda Regio. These experiments used radar interferometry with Arecibo transmitting and Goldstone receiving, on the dates in 2001 given in Table 1. We have generated DEMs with between 500 m and 1 km per pixel resolution, which is more than an order of magnitude improvement over the existing DEM based on Magellan altimetry measurements. The

Table 1

2001	Feb	18
2001	Feb	21
2001	Feb	25
2001	Mar	02
2001	Apr	15
2001	Apr	18
2001	Apr	20
2001	Apr	29
2001	May	08
2001	May	12

new DEMs are merged with Magellan imagery in order to investigate the relationship between the emplacement of the tesserae and the plains. In addition, we are investigating the rifting process in Phoebe Regio which extends through preexisting tesserae terrain. Finally, a high resolution topographic model for the chasma may permit us to generate new constraints on the mode of strain accommodation and effective elastic plate thickness in these regions.

Scientific Rationale: Based on radar imagery, topography, and gravity data, the surface of Venus can be broadly classified into a few different types of regions (see for example, Figure 1). These regions include the highland plateaus



and tesserae, highland swells, plains, and lowlands. These regions are characterized by different tectonic fabrics, topographic signatures, and modes of topographic compensation [e.g., Saunders et al., 1991; Smrekar and Phillips, 1991; Solomon et al., 1992; Simons et al., 1994, 1997]. Inferences from the relationship between gravity and topography as well as from cratering statistics and analysis of imagery, suggest that tessera terrains were emplaced before much of the plains, and are fossils from a previous tectonic regime, and that the highland swells are probably currently active and are among the youngest regions of Venus [e.g., Ivanov and Basilevsky, 1993; Simons et al., 1994; Namiki and Solomon, 1994; Simons et al., 1997]. Further progress in understanding the relationship between these terrains needs both geological analysis using improved topographic information combined with imagery plus continued geophysical modeling to estimate the mechanical structure of the lithosphere at the time of formation of these different regions.

Approach: We have used the delay-Doppler interferometry technique as previously used on Venus [Jurgens et al., 1980, 1988a, b] and on the Moon {Margot et al., 2000], but with the Arecibo transmitter illuminating the planet. Reception of the radar echoes took place at multiple stations at the Goldstone Deep Space Communications Complex. The relative location of these Goldstone antennas is shown in Figure 2.

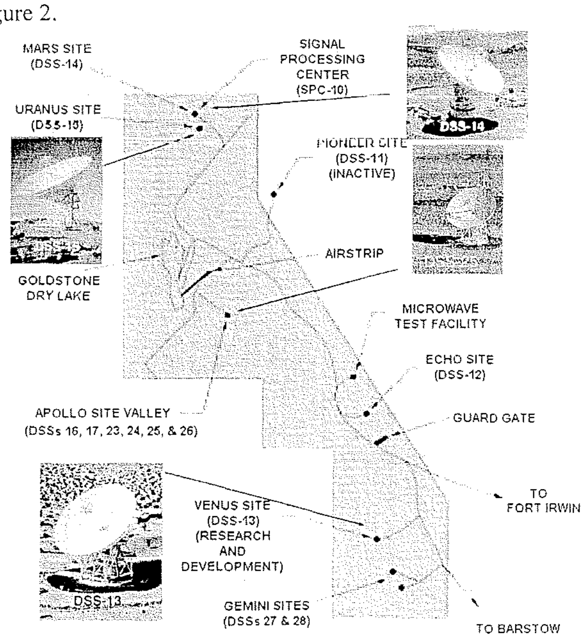


Figure 2

The presentation will give results for the observations that have been analyzed as of LPSC, and will concentrate on the geologic interpretation of such DEMs as have been successfully produced from the Maximum Likelihood Estimator (Jurgens, 1980), which used the relevant Magellan topography as its starting point to speed convergence.

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